

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Hikaru OKUBO, Nobuki TANAKA and
Itaru WATANABE
Serial No.: 10/593,137
Filed: March 16, 2005
For: RESIN COMPOSITION AND SEMICONDUCTOR DEVICE
PRODUCED BY USING THE SAME

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of Patents and Trademarks,
P. O. Box 1450, Alexandria, VA 22313-1450

Sirs:

I, Ryuichi MURAYAMA, a Japanese citizen, residing at c/o SUMITOMO BAKELITE Co., Ltd. 5-8 Higashishinagawa 2-chome, Shinagawa-ku, Tokyo, 140-0002 Japan, hereby declare and state that I graduated from Nihon University, Department of Industrial Chemistry, College of Science and Technology in 1990, and I also declare that I have been employed by SUMITOMO BAKELITE Co., Ltd. since 1990, and I now engage in Electronic Device Materials Research Laboratory I.

I declare that I have read all of the documents concerning the above-entitled patent application and am familiar with the contents of the present invention in this application.

I further declare that the following experiments were conducted by myself and that the results of the experiments are all true and correct to the best of my own knowledge.

[Submission of additional experimental data]

I hereby submit additional Reference Examples E'1 to E'3 to demonstrate that excellent properties as those of the composition of the subject patent application are not obtained even though compound 1 (a bismaleimide compound) is replaced with the bismaleimide of Example C of Herr et al. in Examples E1 to E3 of the subject application.

Reference Examples E'1 to E'3 are the same as Examples E1 to E3 in the Specification of the subject application, except that the bismaleimide of Example C of Herr et al. (referred to as compound 1' in the table below) in place of compound 1 (bismaleimide compound). Other components except compound 1 are the same as those of E1 to E3. The compositions of Reference Examples E'1 to E'3 are shown in the table below.

Reference Examples E'1 to E'3 were conducted in the same manner as Example Series E described in the Specification of the subject application, except adhesion strength 3. In particular, the resin compositions having the compositions shown in the table below were prepared and evaluated in the same method as Example Series E. In Example Series E, resin compositions corresponding to the resin compositions of Claims 23 to 25 of the subject application are evaluated. This time, the compositions of E1 to E3 and E'1 to E'3 were also evaluated for the new item: adhesion strength 3. Evaluation of adhesion strength 3 was conducted in the same manner as adhesion strength 1 and 2 of Example Series E, except that a silicon chip was mounted on a nickel-palladium preplated frame, in place of a silver plated copper frame and a heat spreader made of copper having black oxide surface. The evaluation results of E1 to E3 and E'1 to E'3 are shown in the table below.

As is clear from the comparison between E1 to E3 and E'1 to E'3, compared with the compositions of E'1 to E'3 in which the bismaleimide of Example C of Herr et al. is used in place of compound 1, the corresponding compositions E1 to E3 are very excellent in any of adhesion strengths 1 to 3. Such an effect of using bismaleimide compound (B) would not be readily anticipated by a person skilled in the art.

It has been proved by the above results that even though compound 1 (bismaleimide compound) is replaced with the bismaleimide of Example C of Herr et al. in Examples E1 to E3 in the Specification of the subject application, unlike the composition of the subject application, the resulting compositions cannot obtain excellent adhesion to surfaces to be adhered to (especially a metal surface), while having excellent warpage and reflow resistance.

| | Example | | | Reference Example | | |
|---|---------|-------|-------|-------------------|-------|-------|
| | E1 | E2 | E3 | E'1 | E'2 | E'3 |
| Silver powder | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 |
| Compound 1 | 14.56 | 11.65 | 8.74 | | | |
| Compound 1' | | | | 14.56 | 11.65 | 8.74 |
| Compound 2 | 4.85 | 7.77 | 10.68 | 4.85 | 7.77 | 10.68 |
| Initiator | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| Methacryl silane | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 |
| | | | | | | |
| Adhesion strength 1 (After curing N/chip) | 55 | 55 | 50 | 37 | 33 | 32 |
| Adhesion strength 2 (After curing N/chip) | 60 | 62 | 60 | 52 | 51 | 47 |
| Adhesion strength 3 (After curing N/chip) | 56 | 49 | 47 | 25 | 30 | 29 |
| Warpage (μm) | <20 | <20 | <20 | <20 | <20 | <20 |
| Reflow resistance (Delaminated area %) | <10 | <10 | <10 | <10 | <10 | <10 |
| Comprehensive evaluation | ○ | ○ | ○ | × | × | × |

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated this 24th day of July, 2011

Ryuichi Murayama
Ryuichi MURAYAMA